Syllabus for CHEM 309 Principles of Instrumental Analysis
Fall 2020 MWF 9:00-9:50 am, Andrews 101
Thursdays 6:00-6:50 pm, online
http://blackboard....

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Office hours MWF 11-11:50 or by appointment

Course overview:

- Explore the design and components for modern instruments used for chemical analysis including optical spectroscopy, electroanalytical techniques, mass spectrometry, and separations.
- Gain understanding in the application of these techniques to evaluate data to answer qualitative and quantitative questions about a chemical sample.

Special Note:

There may be challenges that arise this semester both individually, and as a class. A few basic principles I want us all to keep in mind/follow:

1. We are going to prioritize our physical and mental health by:
    - Supporting each other
    - Finding simple solutions that make sense
    - Flexibility and open communication
2. I want us all to have space for intellectual growth and social connection
    - We will have asynchronous content (slides, pre-recorded short lectures, short quizzes)
    - We will have optional synchronous discussion to learn some of the more challenging topics together, and for question/answer and problem solving guidance
3. I will ask everyone to remain flexible and adjust to the situation
    - If circumstances change, we will adapt together

My goal is to provide an interesting and fun series of units that provide a strong introduction to Instrumental Analysis.

This course will have a series of short video lectures for each week. In addition to this, there will be ~2 weekly videos for the laboratory. Quizzes for the class and laboratory videos are due at the end of the week (1/2 credit if completed late). The class is listed as mixed and I would like to have ~ 1/3 of the class come for small group study/questions/discussion on Monday, Wednesday, and Friday during the normal class times. On Thursday evening, the same material will be covered for students that are fully remote (or who choose to meet remotely). Flexibility is the key for this semester, so if needed, any or all of these sessions will be moved to Zoom. My goal is to facilitate smaller group discussion and questions because I have found that works well for this type of material. You will sign up for individual days via a Doodle poll. I recommend that, if possible, you sign up for the same day as your lab group to help form a study group for this class. For the other class periods, I recommend that you use that time to view recorded lectures, take notes, submit questions about the material on blackboard, work through problems, and create study guides.

For all due dates, if special circumstances arise, please contact me and we can figure out a solution.

For all in person interactions in this class, you will be required to wear a mask and sit in appropriately spaced seats in the room (https://www.wm.edu/sites/pathforward/health/index.php). To reach me, please use e-mail and, if I don't reply within 24 hours (48 over the weekend), please e-mail again. Office hours will be via Zoom. Exams will be open note and open book, but you will not be allowed to use the internet except what is available for this course on blackboard. There is no required attendance to any synchronous lectures, for laboratories you should reach out to the Professor running your lab if you need to be absent.

Textbook

Recommended: A. Skoog, F. J. Holler, and S. R. Crouch, Principles of Instrumental Analysis, 7th Edition.

Grading

Problem sets	(4 x 25 points)
Lab reports	(100 points total)
Midterm	(100 points)
Final	(200 points)
Weekly class quiz	(10 x 10 points. There are 11, the lowest will be dropped)
Weekly lab quiz	(10 x 3 points. There are 11, the lowest will be dropped)
Participation	(5 points)

-*Problem sets*: Four graded problem sets will be assigned, each is worth 25 points. Working together is fine, but everyone must hand in their own problem set. Problem sets are due at the end of the week labeled in the table on blackboard and the date/time will be listed at the top of the problem set.

-*Exams*: There will be one midterm exam given in week 8, the exact date is TBA.

-*Final exam*: The final will be November 20th, 9:00 am -12:00 pm.

-*Lab reports*: There are 7 laboratories (see the table at the bottom of Information on blackboard). Be sure to include all group member names on the lab report. Due dates and type of report (individual or group) are listed in the table.

The add/drop deadline is August 18th and the withdraw deadline is October 12th.

The extra hours lost due to the adjusted calendar will be covered via extra videos recorded in response to questions from the class.

-*Grading policy:* Standard ranges for grades will be used to start. These thresholds may be lowered if needed but they will not be raised.

Percentage Score	**Grade**	**Percentage Score**	**Grade**
93-100	**A**	**73-76**	**C**
90-92	**A-**	**70-72**	**C-**
87-89	**B+**	**67-69**	**D+**
83-86	**B**	**60-66**	**D**
80-82	**B-**	**<60**	**F**
77-79	**C+**		

Lecture Topics

1. INTRODUCTION (Chapter 5)
    a. Statistics
    b. Signals and Noise

2. ATOMIC SPECTROSCOPY (Chapters 6-10)
    a. Properties of Light, Instrumentation, and Sources
    b. Absorption
    c. Emission

3. MOLECULAR SPECTROSCOPY (Chapters 13, 14, 16, 17, 19)
    a. UV/VIS
    b. IR
    c. NMR

4. MASS SPECTROMETRY (Chapter 20)
    a. Instrumentation
    b. Elemental & Molecular
    c. Ionization methods

5. SEPARATIONS (Chapters 26-30)
    a. Chromatography (GC, LC)
    b. Electrophoresis
    c. Instrumentation

6. ELECTROCHEMICAL METHODS (Chapters 22-25)
    a. Electrochemical concepts
    b. Potentiometry
    c. Coulometry
    d. Voltammetry

Honor Code:

The College of William & Mary has had an honor code since at least 1779. Academic integrity is at the heart of the university, and we all are responsible for upholding the ideals of honor and integrity. The student-led honor system is responsible for resolving any suspected violations of the Honor Code, and I will report all suspected instances of academic dishonesty to the honor system. The *Student Handbook* (**www.wm.edu/studenthandbook**) includes your responsibilities as a student and the full Code. Your full participation and observance of the Honor Code is expected. To read the Honor Code, see **www.wm.edu/honor**